
Further Nomenclatural Action for the Cypresses (Cupressaceae)

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ABSTRACT. The relationships among cypress species of the closely related genera *Cupressus* L., *Callitropsis* Oerst., and the recently described *Hesperocyparis* Bartel & R. A. Price were examined using morphological characters. Previous studies did not fully resolve New World and Old World cypresses, the status of *Cupressus duclouxiana* B. Hickel, *Cupressus benthamii* Endl., and *Cupressus funebris* Endl. being in question. *Cupressus duclouxiana* is sister to *Hesperocyparis* and *Cupressus benthamii* is sister to *Callitropsis*, while *Cupressus funebris* is considered a basal taxon to all other *Cupressus* investigated. The intrusion of *Hesperocyparis lusitanica* (Mill.) Bartel characters into the standard descriptions of *Cupressus torulosa* D. Don ex Lamb. is examined in order to clarify the differentiation of the respective genera. An emended description of *Callitropsis* constituting a grade of three species is provided. The new combination, *Callitropsis funebris* (Endl.) de Laub. & Husby, is provided for *Cupressus funebris*. Five names at new varietal rank are transferred to *Hesperocyparis*, as *H. arizonica* (Greene) Bartel var. *nevadensis* (Abrams) de Laub. [= *Cupressus nevadensis* Abrams], *H. arizonica* var. *montana* (Wiggins) de Laub. [= *Cupressus montana* Wiggins], *H. goveniana* (Gordon) Bartel var. *abramsiana* (C. B. Wolf) de Laub. [= *Cupressus abramsiana* C. B. Wolf], *H. goveniana* var. *pygmaea* (Lemmon) de Laub. [= *Cupressus goveniana* Gordon var. *pygmaea* Lemmon], and *H. lusitanica* var. *lindleyi* (Klotzsch ex Endl.) de Laub. [= *Cupressus lindleyi* Klotzsch ex Endl.].

Key words: *Callitropsis*, Cupressaceae, *Cupressus*, *Hesperocyparis*.

Three recent publications have divided the species commonly known as cypresses into separate genera. Supported by a large data set based on morphological data, Little (2006) decisively demonstrated that a division would be appropriate and assigned the New World cypresses to the genus *Callitropsis* Oerst. along with the Old World *C. vietnamensis* (Farjon & T. H.

Nguyên) D. P. Little [= *Xanthocyparis vietnamensis* Farjon & T. H. Nguyên]. Adams et al. (2009), after sampling and analyzing nuclear DNA of several species, concurred with the taxonomic separation but established the new genus *Hesperocyparis* Bartel & R. A. Price to include 16 species of the New World cypresses, with the exception of *C. nootkatensis* (D. Don) Oerst. ex D. P. Little, which was previously handled by Little (2006). Similarly, de Laubenfels (2009) also concurred with Little's (2006) analysis and established the new genus *Neocupressus* de Laub. with eight species and seven varieties. The two synonymous genera, *Hesperocyparis* and *Neocupressus*, were separated in priority by five months, with *Hesperocyparis* the prior name. To finish the taxonomic segregation initiated by Little's (2006) study, several nomenclatural transfers and taxonomic considerations remain for the genus *Hesperocyparis* and are addressed herein.

Since the three genera *Hesperocyparis*, *Cupressus* L., and *Callitropsis* are closely related, relationships among all the component species require examination. Adams et al. (2009) treated every New World cypress taxon at the species rank. While de Laubenfels (2009) suggested that *Cupressus benthamii* Endl. may belong in *Callitropsis*, the analysis of Little (2006) resolved *Cupressus benthamii* with all the other New World species, placing it with them in the genus *Callitropsis*. Adams et al. (2009) did not later attempt to resolve the position of those several species of intermediate morphological characters, including *Cupressus benthamii*. Further, the feasibility of distinguishing New and Old World cypresses cladistically with exclusively morphological characters has not yet been demonstrated.

Morphological data continue to provide useful and reliable phylogenetic resolution (Zander, 2003, 2007b; Lee, 2006) for organismal taxonomies. Morphological character states include important information about organisms that can augment molecular markers used in phylogenetic analyses

(Zander, 2007a; Sotiaux et al., 2009). Thus, complementing molecular studies with morphological data aids in understanding taxonomic relationships. We have examined all 22 relevant cypress species morphologically in great detail, including a series of preliminary cladistic analyses, in order to further resolve the position of all possible species of intermediate character.

Cotyledon characters. A primary uniting character for three basal species in this study, as well as for *Cupressus*, is cotyledon phenology. In *Callitropsis nootkatensis*, *Callitropsis vietnamensis* (Farjon & T. H. Nguyễn) D. P. Little, and *Callitropsis funebris* (Endl.) de Laub. & Husby, there are two cotyledons with two additional leaves soon appearing at the same level (suppressed cotyledons), as is the case for all the other Old World cypresses (such as *Cupressus sempervirens* L. and *Cupressus chengiana* S. Y. Hu). *Cupressus benthamii* has multiple cotyledons (not suppressed) as does all of *Hesperocyparis*.

Farjon (2007) took a different interpretation of the cotyledon characters of the cypresses. He argued that two cotyledons do not characterize the Old World cypresses. For *Cupressus chengiana*, Farjon (2005: 191) recorded two to four cotyledons but did not note any frequency of occurrence. Farjon stated that seedling leaves were “initially opposite,” implying that two cotyledons are normal. Silba (1983), who grew seedlings of most *Cupressus* species, unequivocally gave two. Farjon (2005) did not mention cotyledon suppression, a unique trait within Cupressaceae (de Laubenfels, 1953). For *Cupressus torulosa* D. Don ex Lamb., Farjon (2005: 224) reported (two)three or four(five) cotyledons; this, as described here, is incorrect. It follows then that Little’s (2006) statement that two cotyledons distinguish Old World *Cupressus* should continue to be accepted.

Taxonomic identity of Cupressus torulosa. Discrepancies exist between recent descriptions of *Cupressus torulosa* (Farjon, 2005; Eckenwalder, 2009) and the type specimen. These standard descriptions essentially correspond to *Hesperocyparis lusitanica* (Mill.) Bartel. Both taxa are superficially similar and both occur in northwestern India.

I. *Cupressus* L., Sp. Pl. 2: 1002. 1753. TYPE:
Cupressus sempervirens L.

I. *Cupressus torulosa* D. Don ex Lamb., Descr. Pinus 2: 18. 1824. TYPE: India. “Habitat in India Orientali (Roxburgh) in Bhotaniâ,” 1824, W. S. Webb 6046A (lectotype, designated by Franco [1968: 189], p.p. [fertile branch], K-00008810).

The name *Cupressus torulosa* was originally applied to cypresses known from northwestern India eastward to central Nepal and possibly further east. The critical characters include the not drooping, distichous branchlets 0.8–1.1 mm wide × 0.8 mm thick that tend to become bunched and can be long and whiplike. The leaves are dimorphic; the laterals have a keel; and the facial has a central pit, the dimorphic character becoming weak with age. Young plants are glaucous, becoming dark green as they mature. The seed cones have eight to 12 bracts, usually 10, are dark brown when mature, and are glaucous when immature. Seedlings have two cotyledons followed at the same level by two alternating leaves and then alternating whorls of four leaves, which is the condition seen in most Cupressaceae.

Overlapping substantially with *Cupressus torulosa* in northwestern India and possibly extending as far as Assam is *Hesperocyparis lusitanica* [= *C. lusitanica* Mill.]. Cultivated plants are known across this range, but the native distribution is not clear. The foliage branchlets tend to droop and are not distichous, are 1.2–1.5 mm diam., and are spreading. Leaves are not dimorphic and are strongly keeled and glaucous. The seed cones have six to 10 bracts, usually eight, and are strongly glaucous when immature, becoming less so with age. Seedlings have three to five cotyledons, which is typical for *Hesperocyparis*, in contrast with the closely related *Cupressus* and most of Cupressaceae. *Hesperocyparis lusitanica* is generally thought to have been introduced to India from Mexico many years ago (Farjon, 1993), where, as originally described from Portugal (Miller, 1768: *Cupressus* no. 3), it has also successfully escaped into the wild.

Two problems plagued *Cupressus torulosa* from the very beginning. First, Don (1824: 18) mistakenly attributed the type collection to Bhotan [sic] and called his specimen the “Bhotan Cypress” (Wallich 6046A [coll. W. S. Webb in Soorch]). In reality, the collection place was in northwestern India (Franco, 1968), and the mislocation contributed to the confusion of eastern species with *C. torulosa*. The second distraction was the fact that two collections were cited, the second (Wallich 6046C [coll. Roxburgh]), which was collected nearby but attributed by Don to eastern India, was a small piece of *Hesperocyparis lusitanica* with an immature seed cone. The fact that Don called his new species the Bhotan Cypress and that the next year he cited only the “Bhotan” specimen in his *Flora Nepalensis* (1825) supports the decision of Franco (1968) to designate it as the lectotype (the fruiting material, not the associated sterile fragment of *Juniperus* L.). No

wonder that Endlicher (1847: 57) indicated “Butan et Nepalia” as the habitat for *C. torulosa*.

Wallich, who assembled the specimens cited by Don, also sent seed the same year that *Cupressus torulosa* was published “in 1824, and again in 1830” (Loudon, 1854: 2479). Soon young plants were under cultivation in Europe. In 1842, Loudon illustrated what is clearly the correct taxon for *C. torulosa*, calling it “[t]he Bhotan, or twisted, Cypress,” an error, for *torulosa* does not refer to a twisted form (cf. Loudon, 1854: 2479, figs. 2329–2331; Loudon, 1869: 1076, fig. 2000). More collections of diverse cypresses were rapidly being delivered from India, Nepal, and Bhutan, leading Lindley (1853: 168) to question whether there might be more than one cypress native to India based on differences among the specimens raised in England. He presented an oversized illustration (1853: 167, fig. 105) of a plant cultivated from Himalayan seeds described with glaucous foliage not at all flattened, which clearly identifies this as *Hesperocyparis lusitanica*, although Masters (1896) attributed this to *C. macrocarpa* Hartw. ex Gordon.

Various compilations in the 19th century gave descriptions for *Cupressus torulosa*. Carrière (1855: 118) referred to drooping branchlets, glaucous foliage, and glaucous seed cones, but never mentioned flattening, i.e., *Hesperocyparis lusitanica*. Gordon (1858: 69) also referred to drooping branchlets and glaucous leaves, which suggested *H. lusitanica*. Gordon further referred to *C. torulosa* as the “weeping cypress of travellers,” and he noted two cotyledons as well as the “Twisted or Bhotan Cypress.” In spite of Lindley’s admonition, all Himalayan cypresses were mistaken as similar. Even Camus (1914), who published a monograph on cypresses, repeated the same critical traits as Carrière.

It may seem remarkable that *Cupressus torulosa* and *Hesperocyparis lusitanica* could be so unquestionably combined, but specimens of the two species are, in fact, quite similar. They both have scale leaves and seed cones of about the same size (*C. torulosa* 12–20 × 12–18 mm vs. *H. lusitanica* 12–20 × 12–20 mm). The dimorphism of *C. torulosa* scale leaves on mature specimens is not obvious. Distichous branchlets when pressed require close observation; glaucousness generally disappears on dried specimens, and cotyledons are rarely available. Hill and de Fraine (1908) reported that the cotyledon number is three to five for *C. torulosa*, which is an error, but this was repeated by subsequent authors (Elwes & Henry, 1910; Camus, 1914; Ouden, 1949; Silba, 2005). Because *H. lusitanica* was commonly cultivated under the name *C. torulosa*, the confusion is not surprising.

In 1968, Franco correctly specified the lectotype of *Cupressus torulosa*. He did not give a description of the species but did append a list of the specimens consulted, of which many were, in fact, *Hesperocyparis lusitanica*. Only Shrestha (1974), among modern authors, restricted his brief description to characters appropriate to *C. torulosa*. In treating the *Gymnosperms of Nepal*, Shrestha presumably inspected actual living wild trees.

Farjon (2005: 223) continued the taxonomic confusion in his monograph of the Cupressaceae, describing *Cupressus torulosa* with the branchlets often with drooping ends, the leaves monomorphic, and the cotyledons (two)three or four(five). There is no mention of distichousness, and this description would encompass *Hesperocyparis lusitanica*. Even Eckenwalder (2009: 231), in his recent *Conifers of the World*, treated *C. torulosa* essentially the same as Farjon with characters preponderant for *H. lusitanica*. Finally, the monograph of Silba (2005) would go so far as to treat *C. torulosa* as a subspecies of *H. lusitanica*. However, *C. torulosa* is an important tree in India and Nepal, and the taxon needs careful distinction from *H. lusitanica*.

KEY COUPLET TO DISTINGUISH *CUPRESSUS TORULOSA* AND
HESPEROCYPARIS LUSITANICA

- 1a. Branchlets distichous; leaves dimorphic; cotyledons 2; branch ends not drooping
..... *Cupressus torulosa*
- 1b. Branchlets not distichous; leaves monomorphic; cotyledons 3 to 5; branch ends drooping
..... *Hesperocyparis lusitanica*

Relationship of Cupressus duclouxiana. The whole of the characters examined resolves *Cupressus duclouxiana* B. Hickel as sister to the eight species analyzed for *Hesperocyparis*. *Cupressus duclouxiana* differs from the Old World *Cupressus* primarily by shoots that are not distichous and foliage that is not dimorphic, in marked contrast to the rest of *Cupressus* (and a large part of Cupressaceae). On the other hand, *C. duclouxiana* does have cotyledon characters like *Callitropsis* that are not found in *Hesperocyparis* but are present in *Cupressus*. This character combination places it with *Juniperus*, which is either sister to a larger cypress group or in a polytomy with cypresses (Little, 2006). This character suite is also shared by *Widdringtonia* Endl., and this genus would likely have a similar position as *Juniperus* had it been included in Little’s (2006) analysis. The seed cones of *Juniperus* are more or less fleshy and do not open when mature, and there is usually one wingless seed per fertile bract. The seed cones of *Widdringtonia* are reduced to four bracts, like many of those in

Juniperus, and become warty as they mature. *Cupressus duclouxiana* exhibits intermediate morphology between the Old and New World cypresses. Qualitative characters, such as the suppressed cotyledons that distinguish *C. duclouxiana*, are more significant than quantitative characters. Numbers of cone scales, seeds per scale, pollen sacs per scale, size of cones, and such characters vary, often quite freely, both within and among species or even on individuals of *Cupressus* and many other species. Binary analysis does not distinguish between qualitative and quantitative characters. When a distinctive qualitative character is absent, it may simply have been lost, or displaced by introgression, or even overlooked, as is sometimes the case with anatomical and micromorphological characters. The fact that *C. duclouxiana* has the cotyledon characters of *Cupressus* firmly unites it with that genus. As *C. duclouxiana* has one of the two major characters that distinguish *Cupressus* from *Hesperocyparis*, the conclusion here is that it should not be included within *Hesperocyparis*. Molecular data (Rushforth et al., 2003) and Little's (2006) analysis also support the retention of *C. duclouxiana* in *Cupressus*.

Relationship of Cupressus benthamii. In our morphological cladograms (unpublished), *Cupressus benthamii* does not group with *Hesperocyparis* and is sister to a clade containing *Cupressus* and *Hesperocyparis*. This is consistent with de Laubenfels (2009), who emphasized its dimorphic leaves and distichous shoots that distinguish the taxon from the New World cypresses. Similarly, Little (2006) presented a morphological cladogram that resolved *Callitropsis vietnamensis* as sister to all cypresses and placed *Cupressus funebris*, *Callitropsis nootkatensis*, and *Cupressus benthamii* in a subtending polytomy to a clade containing all other Old and New World cypresses. Nativity to the New World alone is insufficient for inclusion of *Cupressus benthamii* in *Hesperocyparis*, especially because *Callitropsis* is also found in the New World. Related Old World genera with species in the New World include *Thuja* L., *Chamaecyparis* Spath, *Calocedrus* Kurz, *Juniperus*, and *Callitropsis*. In contrast, molecular characters place *Cupressus benthamii* within the New World cypresses (Bartel et al., 2003; Little, 2006). The consistently multiple cotyledons (cotyledons not suppressed) of *Cupressus benthamii*, a key synapomorphy of *Hesperocyparis*, also sets it apart from both *Cupressus* and *Callitropsis*. Nevertheless, the same kind of argument used for *Cupressus duclouxiana* supports placement of *Cupressus benthamii* either in *Cupressus* or *Callitropsis*. Both combinations have already been made.

Relationship of Cupressus funebris. Our morphological studies place *Cupressus funebris* remote from all other cypresses and sister to all other in-group taxa included in the study. Prior studies utilizing molecular characters placed *C. funebris* within the Old World cypresses (Rushforth et al., 2003). There has been a lively discussion concerning its relationship to *Chamaecyparis* (Franco, 1941; Konar & Banerjee, 1963; Gadek & Quinn, 1987; Jagel & Stützel, 2001; Farjon, 2005). *Cupressus funebris* does not belong in *Chamaecyparis*, but shared morphological characters (small deciduous seed cones with few seeds per bract, entire leaf margins, and longer lateral leaves) are also shared with *Callitropsis*. Unlike *Callitropsis*, *Cupressus funebris* resembles *Cupressus* in having three or four pairs of seed cone bracts instead of two or three with the uppermost bracts connate and in having four pollen sacs per scale instead of two or three.

Relationship of Callitropsis. The generic limits of *Callitropsis* have raised questions. Little's (2006) concept of the genus includes all New World cypresses and *C. vietnamensis*. Debreczy et al. (2009) have tentatively argued that *C. nootkatensis* and *C. vietnamensis* might better be treated in separate genera already available. In Little's (2006) molecular and combined analyses, the clade containing those two species is less strongly supported than the clades containing *Cupressus* or *Hesperocyparis*. In Little's (2006) morphological character tree, these two *Callitropsis* species fall outside the *Cupressus* and *Hesperocyparis* clades. The situation is further complicated by the proposal of Mill and Farjon (2006) to conserve *Xanthocyparis* Farjon & Hiep against *Callitropsis*. If strict monophyly is required for all cypresses, one path forward would be simply to erect a new genus for *Cupressus funebris*. However, the three species in question are part of a basal grade to the cypresses, sensu Little (2006). We recommend here that *Cupressus funebris* be included in *Callitropsis* to recognize its distinctive suite of morphological characters that place it close to the already recognized *Callitropsis* species. As noted by de Laubenfels (2009), *Cupressus benthamii* has several characters that ally it to *Callitropsis*, including distichous branchlets, dimorphic leaves, and seed cones with four fertile scales. However, other characters ally it to the New World cypresses and include multiple cotyledons, 10 seeds per scale, and persistent ovulate cone.

The proposed generic circumscription renders *Callitropsis* paraphyletic on a morphological basis. There is an extensive ongoing debate about whether paraphyletic taxa are acceptable in modern system-

atics (Brummitt, 1997; Sosef, 1997; Nordal & Stedje, 2005; Ebach et al., 2006; Zander, 2007c). Evolutionary systematists argue that paraphyly is a natural consequence of evolution and thus should be recognized if systematics is to reflect evolutionary processes (Brummitt, 2006; Farjon, 2007; Zander, 2007b). An argument can also be made on practical grounds that recognition of some paraphyletic groups allows taxonomy to reflect key organismal characters that separate groups with distinctive forms and functions from other members of the same clade. In this case, circumscribing the basal grade of cypress species into *Callitropsis* can recognize their shared characters while avoiding a proliferation of monotypic genera or lumping all cypresses into *Cupressus*, which would be required by strict monophyly using our organismal data. Monophyly is clearly an important criterion to consider in classification but need not be the only consideration. A broad array of analyses and data, including phylogenetic analyses, can inform classification (Hörandl, 2006).

The genus *Callitropsis* has been treated in a number of ways including one, two, or 18 natural species, each treatment potentially generating a distinct generic concept. By recognizing the bulk of the 18 taxa as *Hesperocyparis* (Adams et al., 2009), the following emended generic diagnostic description becomes appropriate.

I. *Callitropsis* Oerst., Vidensk. Meddel. Naturhist. Foren. Kjøbenhavn, ser. 2, vol. 6: 32. 1864. [1865]. TYPE: *Cupressus nootkatensis* D. Don, Descr. Pinus [Lambert] 2: 18. 1824 [= *Callitropsis nootkatensis* (D. Don) Oerst. ex D. P. Little, Syst. Bot. 31(3): 474. 2006].

Branchlets distichous. Cotyledons 2 with 2 additional leaves soon appearing at the same level followed by alternating whorls of 4 linear leaves, which give way to whorls of 3 and then 2 followed by the scale form; leaves scalelike, dimorphic, lateral leaves sharply folded and longer than facial leaves, especially in juvenile specimens; mature leaves strictly acute with a gland present in the groove. Pollen cones with 5 to 7 pairs of bracts. Seed cones with 2 to 4 opposite pairs of bracts (rarely more), 8–12 mm diam., maturing in 2 growing seasons and then opening to shed the seed, not persistent, 2 to 4 seeds on each bract.

Included species (3). *Callitropsis nootkatensis*, *C. vietnamensis*, and *C. funebris*.

Nomenclatural actions for Callitropsis and Hesperocyparis. New World cypresses characteristically occur in isolated relict groves, sometimes quite

remote. Small differences from one grove to the next can often be detected, leading to the establishment of varieties (Little, 1966, 1970; Bartel, 1993; Eckenwalder, 1993; Farjon, 2005; de Laubenfels, 2009) or subspecies (Murray, 1982; Silba, 2005). Despite limited differences, the New World cypresses have often all been given specific rank (Wolf, 1948; Little, 2006; Bartel in Adams et al., 2009). No varieties have been recognized since the delineation of *Hesperocyparis* Bartel & R. A. Price (in 2009). Herein we establish five requisite varieties. The one species *Cupressus funebris* is transferred herein to *Callitropsis*.

I. *Callitropsis funebris* (Endl.) de Laub. & Husby, comb. nov. Basionym: *Cupressus funebris* Endl., Syn. Conif., 58. 1847. *Chamaecyparis funebris* (Endl.) Franco, Agros 24: 93. 1941. *Platycyparis funebris* (Endl.) A. V. Bobrov & Melikyan, Komarovia 4: 73. 2006. TYPE: China. Zhejiang (cult.), *G. L. Staunton s.n.* (lectotype, designated by Farjon [2005: 200], BM).

II. *Hesperocyparis* Bartel & R. A. Price, Phytologia 91(1): 179. [Apr.] 2009. *Neocupressus* de Laub., Novon 19(3): 301. [Sep.] 2009, syn nov. TYPE: *Cupressus macrocarpa* Hartw. ex Gordon [= *Hesperocyparis macrocarpa* (Hartw. ex Gordon) Bartel].

I. *Hesperocyparis arizonica* (Greene) Bartel, Phytologia 91(1): 180. [Apr.] 2009. Basionym: *Cupressus arizonica* Greene, Bull. Torrey Bot. Club 9: 64–65. 1882. *Cupressus benthamii* Endl. var. *arizonica* (Greene) Mast., J. Linn. Soc., Bot. 31: 340. 1896. *Callitropsis arizonica* (Greene) D. P. Little, Syst. Bot. 31: 473. 2006. *Neocupressus arizonica* (Greene) de Laub., Novon 19(3): 302. 2009. TYPE: U.S.A. Arizona: Clifton, on the mtns. back of Clifton, in extreme E part of Arizona, 1 Sep. 1880, *E. L. Greene s.n.* (lectotype, designated by Little [2006: 473], NDG not seen; isolectotypes, K, NA not seen, NY).

1a. *Hesperocyparis arizonica* (Greene) Bartel var. **arizonica**.

1b. *Hesperocyparis arizonica* (Greene) Bartel var. **montana** (Wiggins) de Laub., comb. nov. Basionym: *Cupressus montana* Wiggins, Contr. Dudley Herb. 1: 161. 1933. *Cupressus arizonica* Greene var. *montana* (Wiggins) Little, Madroño 18: 163. 1966. *Cupressus arizonica* Greene subsp. *montana* (Wiggins) A. E. Murray, Kalmia 15: 11. 1985. *Callitropsis montana* (Wiggins) D. P. Little, Syst. Bot. 31: 474. 2006. *Hesperocyparis montana* (Wiggins) Bartel, Phytologia

91(1): 182. [Apr.] 2009. *Neocupressus arizonica* (Greene) de Laub. var. *montana* (Wiggins) de Laub., Novon 19(3): 302. [Sep.] 2009. TYPE: Mexico. Baja California: Sierra San Pedro Mártir, La Encantada, 22 Sep. 1930, *I. L. Wiggins & D. Demaree 4990* (holotype, DS; isotypes, F not seen, MEXU not seen, NA not seen, NY [barcode] 00001299, RSA, SD not seen, US-01635428).

1c. *Hesperocyparis arizonica* (Greene) Bartel var. ***nevadensis*** (Abrams) de Laub., comb. nov. Basionym: *Cupressus nevadensis* Abrams, Torreyia 19: 92. 1919. *Cupressus macnabiana* A. Murray bis var. *nevadensis* (Abrams) Abrams, Ill. Fl. Pacific States 1: 73. 1923. *Cupressus arizonica* Greene var. *nevadensis* (Abrams) Little, Madroño 18: 164. 1966. *Cupressus arizonica* Greene subsp. *nevadensis* (Abrams) A. E. Murray, Kalmia 12: 19. 1982. *Callitropsis nevadensis* (Abrams) D. P. Little, Syst. Bot. 31: 474. 2006. *Neocupressus arizonica* (Greene) de Laub. var. *nevadensis* (Abrams) de Laub., Novon 19(3): 302. 2009. TYPE: U.S.A. California: Kern Co., Piute Mtns., Red Hill near Bodfish, 29 July 1915, *L. Abrams 5368* (holotype, DS not seen; isotypes, NY, RSA, US).

KEY TO VARIETIES OF *HESPEROCYPARIS ARIZONICA*

- 1a. Ovulate cone opens at maturity; seeds strictly non-glaucous var. *montana*
- 1b. Ovulate cone serotinous; seeds often glaucous 2
- 2a. Glands on leaves weak or absent var. *arizonica*
- 2b. Glands on leaves conspicuous and active
..... var. *nevadensis*

2. *Hesperocyparis goveniana* (Gordon) Bartel, Phytologia 91(1): 181. [Apr.] 2009. Basionym: *Cupressus goveniana* Gordon, J. Hort. Soc. London 4: 295. 1849. *Callitropsis goveniana* (Gordon) D. P. Little, Syst. Bot. 31: 473. 2006. *Neocupressus goveniana* (Gordon) de Laub., Novon 19(3): 303. [Sep.] 2009. TYPE: U.S.A. California: Monterey Co., cultivated from seeds collected by Hartweg in mtns. of Monterey, 2 mi. from sea, 1849, *Anonymous s.n.* (holotype, K).

2a. *Hesperocyparis goveniana* (Gordon) Bartel var. ***goveniana***.

2b. *Hesperocyparis goveniana* (Gordon) Bartel var. ***abramsiana*** (C. B. Wolf) de Laub., comb. nov. Basionym: *Cupressus abramsiana* C. B. Wolf, Aliso 1: 215. 1948. *Cupressus goveniana* Gordon var. *abramsiana* (C. B. Wolf) Little, Phytologia 20: 435. 1970. *Cupressus goveniana* Gordon

subsp. *abramsiana* (C. B. Wolf) A. E. Murray, Kalmia 12: 19. 1982. *Callitropsis abramsiana* (C. B. Wolf) D. P. Little, Syst. Bot. 31: 473. 2006. *Neocupressus goveniana* (Gordon) de Laub. var. *abramsiana* (C. B. Wolf) de Laub., Novon 19(3): 303. [Sep.] 2009. TYPE: U.S.A. California: Santa Cruz Co., Ben Lomond near Bonnie Doon, 9 Nov. 1934, *C. B. Wolf 6235* (holotype, RSA-352340; isotypes, BH, CAS not seen, DS not seen, GH-22464 digital image, K, MEXU not seen, MO not seen, NA not seen, NY [barcode] 00001288–1290 [3 sheets] digital images, SD-40670 digital image).

2c. *Hesperocyparis goveniana* (Gordon) Bartel var. ***pygmaea*** (Lemmon) de Laub., comb. nov. Basionym: *Cupressus goveniana* Gordon var. *pygmaea* Lemmon, Cone-bear. Trees Pacif. Slope, ed. 3: 77. 1895, as “*pigmaea*.” *Cupressus pygmaea* (Lemmon) Sarg., Bot. Gaz. 31: 239. 1901. *Cupressus goveniana* Gordon subsp. *pigmaea* (Lemmon) A. Camus, Encycl. Econ. Sylvicult. 2: 50. 1914. *Callitropsis pygmaea* (Lemmon) D. P. Little, Syst. Bot. 31: 474. 2006. *Neocupressus goveniana* (Gordon) de Laub., Novon 19(3): 303. [Sep.] 2009. TYPE: U.S.A. California: Mendocino Co., White Plains, back from the coast, *J. G. Lemmon & wife s.n.* (lectotype, designated by Wolf [1948: 200], UC-185946; isolectotype, DS-164622).

KEY TO VARIETIES OF *HESPEROCYPARIS GOVENIANA*

- 1a. Seeds shiny black var. *pygmaea*
- 1b. Seeds dull brown 2
- 2a. Seeds not glaucous var. *goveniana*
- 2b. Seeds usually glaucous var. *abramsiana*

3. *Hesperocyparis lusitanica* (Mill.) Bartel, Phytologia 91(1): 181. [Apr.] 2009. Basionym: *Cupressus lusitanica* Mill., Gard. Dict., ed. 8, *Cupressus* no. 3. 1768, as “*Lusitanica*.” *Callitropsis lusitanica* (Mill.) D. P. Little, Syst. Bot. 31: 474. 2006. *Neocupressus lusitanica* (Mill.) de Laub., Novon 19(3): 304. [Sep.] 2009. TYPE: Portugal. Cultivated in Herb. Miller, *Anonymous s.n.* (holotype, BM).

3a. *Hesperocyparis lusitanica* (Mill.) Bartel var. ***lusitanica***.

3b. *Hesperocyparis lusitanica* (Mill.) Bartel var. ***lindleyi*** (Klotzsch ex Endl.) de Laub., comb. nov. Basionym: *Cupressus lindleyi* Klotzsch ex Endl., Syn. Conif., 59. 1847. *Cupressus lusitanica* Mill. var. *lindleyi* (Klotzsch ex Endl.) Carrière, Traité Gén. Conif., ed. 2: 156. 1867.

Cupressus benthamii Endl. var. *lindleyi* (Klotzsch ex Endl.) Mast., J. Linn. Soc., Bot. 31: 339. 1896. *Hesperocyparis lindleyi* (Klotzsch ex Endl.) Silba, J. Int. Conifer Preserv. Soc. 16(2): 67. [Aug.] 2009. *Neocupressus lusitanica* (Mill.) de Laub. var. *lindleyi* (Klotzsch ex Endl.) de Laub., Novon 19(3): 304. [Sep.] 2009. TYPE: Mexico. Michoacán: betw. Anganguero & Tlalpujahua, 1839, *C. T. Hartweg 437* (lectotype, designated by de Laubenfels [2009: 304], K; isolectotypes, BM, MO not seen).

Hesperocyparis lindleyi (Klotzsch ex Endl.) Silba subsp. *hondurensis* (Silba) Silba, J. Int. Conifer Preserv. Soc. 16(2): 67. 2009, syn. nov. *Cupressus lusitanica* Mill. var. *hondurensis* Silba, Phytologia 68: 30. 1990. *Cupressus lindleyi* Klotzsch ex Endl. var. *hondurensis* (Silba) Silba, J. Int. Conifer Preserv. Soc. 1(1): 26. 1994. TYPE: Honduras. Intibucá: La Esperanza, *S. D. Enamorado 100* (holotype, NY).

Variety *lindleyi* differs from the type of *Hesperocyparis lusitanica* in the thicker branchlets (1.5–2.1 mm vs. 1.2–1.5 mm) and the larger seed cones (15–23 mm vs. 10–18 mm).

Because *Hesperocyparis* was published before *Neocupressus*, it is necessary to transfer the varieties of various species in *Neocupressus* to be recognized here to the former genus. *Hesperocyparis forbesii* (Jeps.) Bartel and *H. glabra* (Sudw.) Bartel are here accepted as species, and the synonyms of *N. arizonica* var. *glabra* (Greene) de Laub., *Cupressus stephensonii* C. B. Wolf, and *C. arizonica* var. *reveliana* Silba, are therefore considered synonyms of *H. glabra*.

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